

Enabling closed-loop control of high degree-of-freedom soft robotic structures

Completed Technology Project (2017 - 2021)



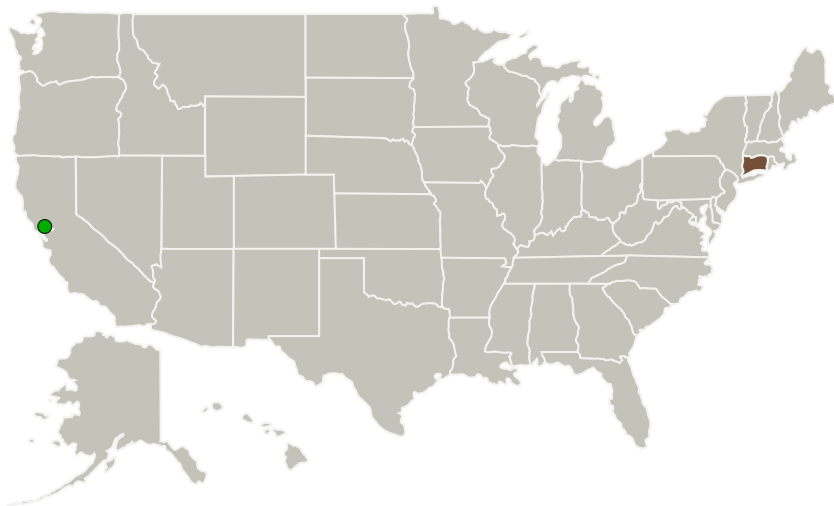
Project Introduction

To expand the nation's capabilities for space exploration, a new approach to robotic manipulation is proposed. The approach utilizes soft materials to create an extremely dexterous manipulator which can accurately control its pose without use of an external sensor. This enables safe interaction between robotic systems, tools, and humans in cluttered spacecraft. Unlike more conventional robots made out of hard plastics and metals, the robot can be manufactured, expanded, and repaired onboard spacecraft. During launch, the majority of the robot's materials can be stored as a liquid in jars. When the mission requires a robot, the standardized modules can simply be cast inside a standardized mold, combined with their circuitry, and assembled into the desired configuration. Training of the robot is done in a shape-agnostic fashion, allowing the approach to be applied to arbitrary manipulator configurations, in addition to broader classes of objects including robotic fabrics.

Anticipated Benefits

To expand the nation's capabilities for space exploration, a new approach to robotic manipulation is proposed. This approach enables safe interaction between robotic systems, tools, and humans in cluttered spacecraft.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Yale University	Lead Organization	Academia	New Haven, Connecticut
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations

Connecticut

Project Website:

<https://www.nasa.gov/strg#.VQb6T0jJzyE>

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Yale University

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

Rebecca K Kramer

Co-Investigator:

Dylan S Shah

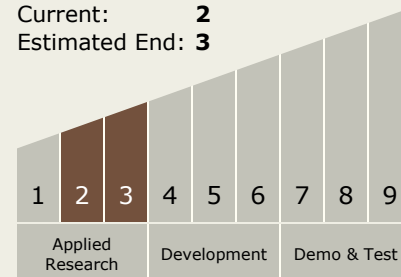
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Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



Technology Areas

Primary:

- TX04 Robotic Systems
 - └ TX04.3 Manipulation
 - └ TX04.3.1 Dexterous Manipulation

Target Destinations

Earth, The Moon, Mars